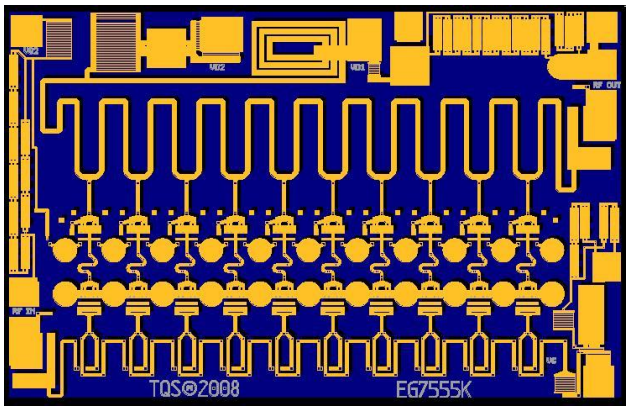
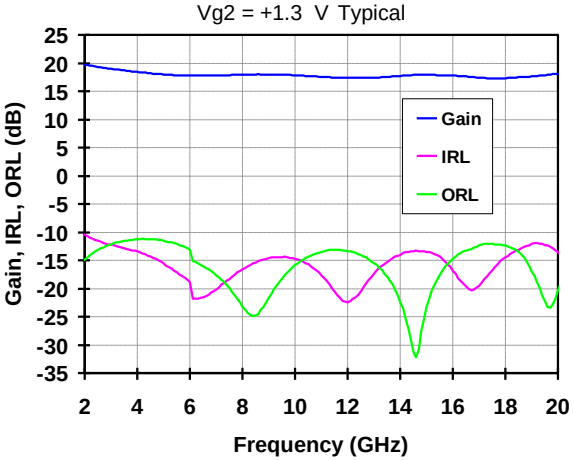
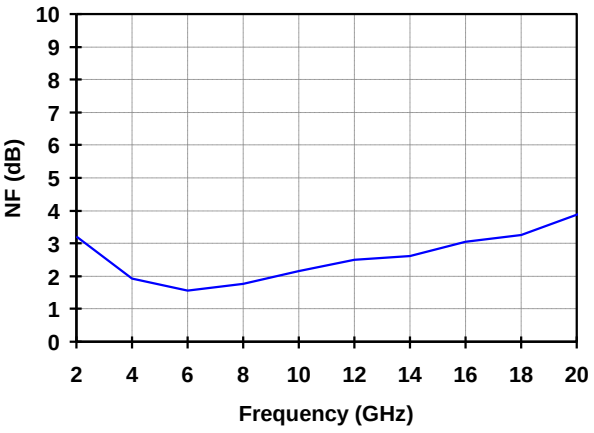
2 - 20 GHz Low Noise Amplifier with AGC



Measured Performance

Bias conditions: Vd = 5 V, Id = 100 mA, Vg1 = -0.55 V , Vg2 = +1.3 V Typical





Key Features

- Frequency Range: 2 - 20 GHz
- Midband NF: 2.5 dB
- Gain: 17.5 dB
- >30 dB adjustable gain with Vg2
- TOI: 29 dBm Typical
- 22 dBm Nominal Psat, 20 dBm Nominal P1dB
- ESD Protection circuitry on Vd, Vg1, and Vg2
- Bias: Vd = 5 V, Id = 100 mA, Vg1 = -0.55 V, Vg2 = +1.3 V, Typical
- Technology: 3MI 0.15 um Power pHEMT
- Chip Dimensions: 2.090 x 1.350 x 0.100 mm

Primary Applications

- Wideband Gain Block / LNA
- X-Ku Point to Point Radio
- Electronic Warfare Applications

Product Description

The TriQuint TGA2526 is a compact LNA Gain Block MMIC with adjustable gain control (AGC). The LNA operates from 2-20 GHz and is designed using TriQuint's proven standard 0.15 um Power pHEMT production process.

The TGA2526 provides a nominal 20 dBm of output power at 1 dB gain compression with a small signal gain of 17.5 dB. Greater than 30 dB adjustable gain can be achieved using the Vg2 pin. Typical noise figure is 2.5 dB at 12 GHz. Special circuitry on Vd, Vg1 and Vg2 pins provides ESD protection.

The TGA2526 is suitable for a variety of wideband systems such as point to point radios, radar warning receivers and electronic counter measures.

The TGA2526 is 100% DC and RF tested on-wafer to ensure performance compliance. The TGA2526 has a protective surface passivation layer providing environmental robustness.

Lead-Free & RoHS compliant.
Evaluation Boards are available upon request.

Datasheet subject to change without notice.

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Table I
Absolute Maximum Ratings 1/

Symbol	Parameter	Value	Notes
Vd-Vg	Drain to Gate Voltage	9 V	
Vd	Drain Voltage	7 V	2/
Vg1	Gate # 1 Voltage Range	-2 to 0 V	
Vg2	Gate # 2 Voltage Range	-2 to +3 V	
Id	Drain Current	144 mA	2/
Ig1	Gate # 1 Current Range	-20 to 14 mA	
Ig2	Gate # 2 Current Range	-20 to 14 mA	
Pin	Input Continuous Wave Power	22 dBm	2/
Tchannel	Channel Temperature	200 °C	

1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device and / or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.

2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum power dissipation listed in Table IV.

3/ ESD protection diodes on Vd, Vg1 and Vg2 will conduct current for voltages approaching turn-on voltages. Diode turn-on voltage levels will decrease with decreasing temperature.

Table II
Recommended Operating Conditions

Symbol	Parameter 1/	Value
Vd	Drain Voltage	5 V
Id	Drain Current	100 mA
Id_Drive	Drain Current under RF Drive	144 mA
Vg1	Gate # 1 Voltage	-0.55 V
Vg2	Gate # 2 Voltage	1.3 V

1/ See assembly diagram for bias instructions.

Table III
RF Characterization Table

Bias: Vd = 5 V, Id = 100 mA, Vg1 = -0.55 V, Vg2 = +1.3 V, typical

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	NOMINAL	MAX	UNITS
Gain	Small Signal Gain	f = 2 – 18 GHz f = 18 – 20 GHz	16 15	17.5 16	- 	dB
IRL	Input Return Loss	f = 2 – 4 GHz f = 4 – 20 GHz	10 12	11 13	- -	dB
ORL	Output Return Loss	f = 2 – 6 GHz f = 6 – 20 GHz	10 10	11 13	- -	dB
Psat	Saturated Output Power	f = 2 – 18 GHz f = 18 – 20 GHz	- -	22 20	-	dBm
P1dB	Output Power @ 1dB Compression	f = 2 – 16 GHz f = 16 – 20 GHz	17 15	20 17	- -	dBm
TOI	Output TOI	f = 2 – 12 GHz f = 12 – 20 GHz	- -	30 26	- -	dBm
NF	Noise Figure	f = 2 – 4 GHz f = 4 – 14 GHz f = 14 – 20 GHz	- - -	3 2.5 3.5	3.5 3 4.5	dB

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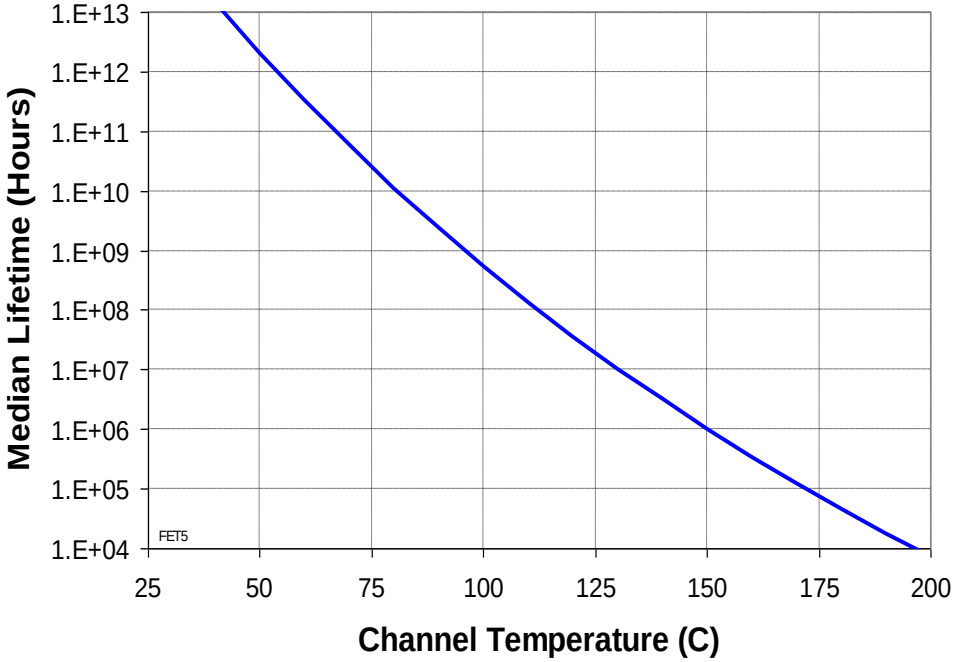
Table IV
Power Dissipation and Thermal Properties

Parameter	Test Conditions	Value
Maximum Power Dissipation	Tbaseplate = 70 °C	Pd = 1.01 W Tchannel = 113 °C Tm = 9.1 E+7 Hrs
Thermal Resistance, θjc	Vd = 5 V Id = 100 mA Pd = 0.5 W	θjc = 42.2 °C/W Tchannel = 91 °C Tm = 2.0 E+9 Hrs
Thermal Resistance, θjc Under RF Drive	Vd = 5 V Id = 144 mA Pout = 22 dBm Pd = 0.562 W	θjc = 42.2 °C/W Tchannel = 94 °C Tm = 1.3 E+9 Hrs
Mounting Temperature	30 Seconds	320 °C
Storage Temperature		-65 to 150 °C

Median Lifetime vs Channel Temperature



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Measured Data

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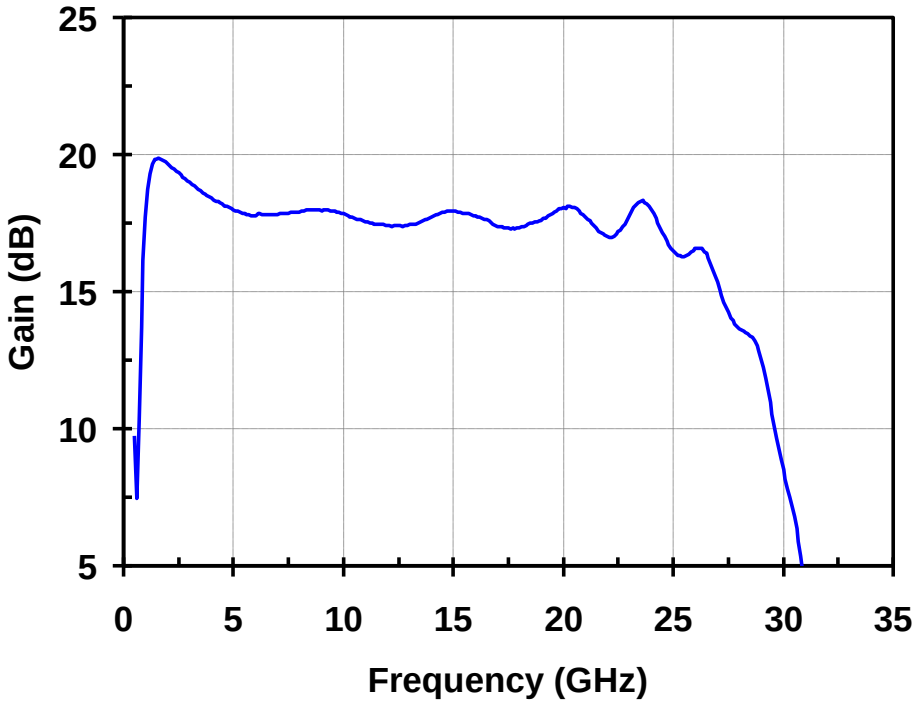

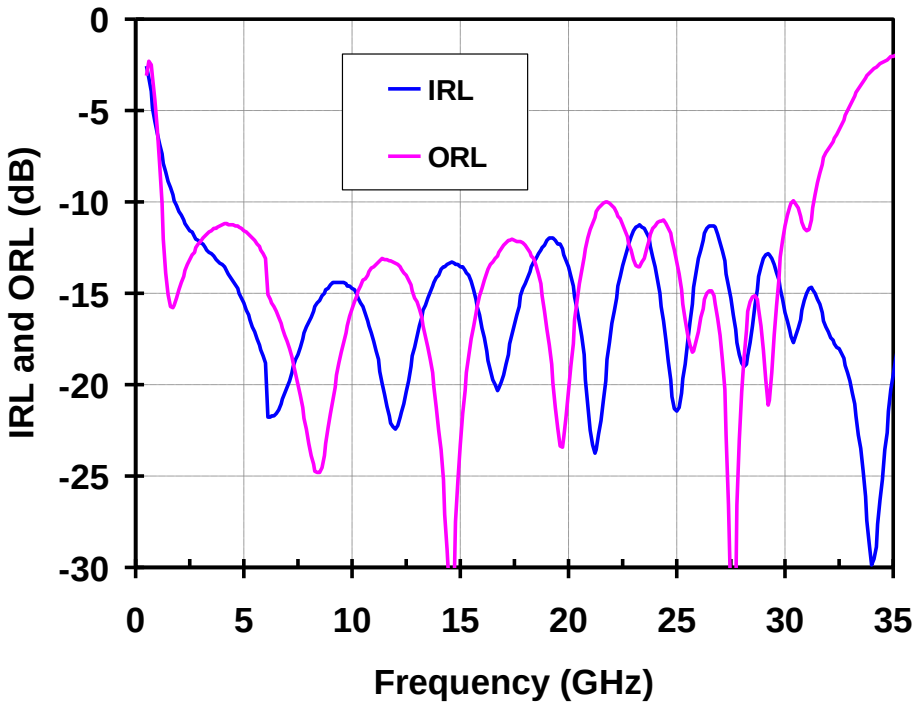

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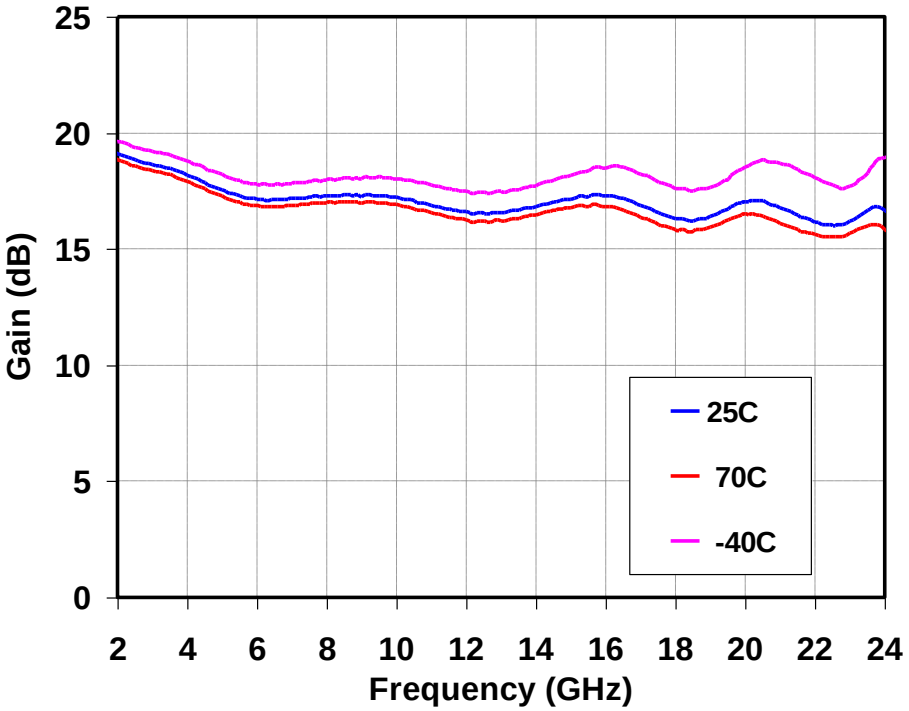
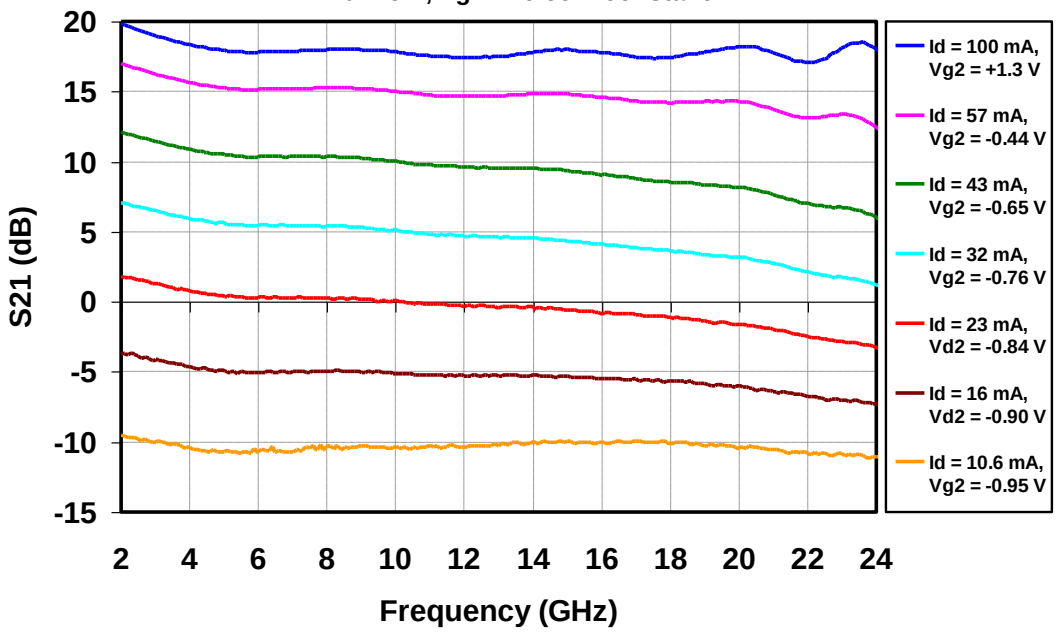


Gain tuned by adjusting Vg2
Vd = 5 V, Vg1 = -0.55 V constant



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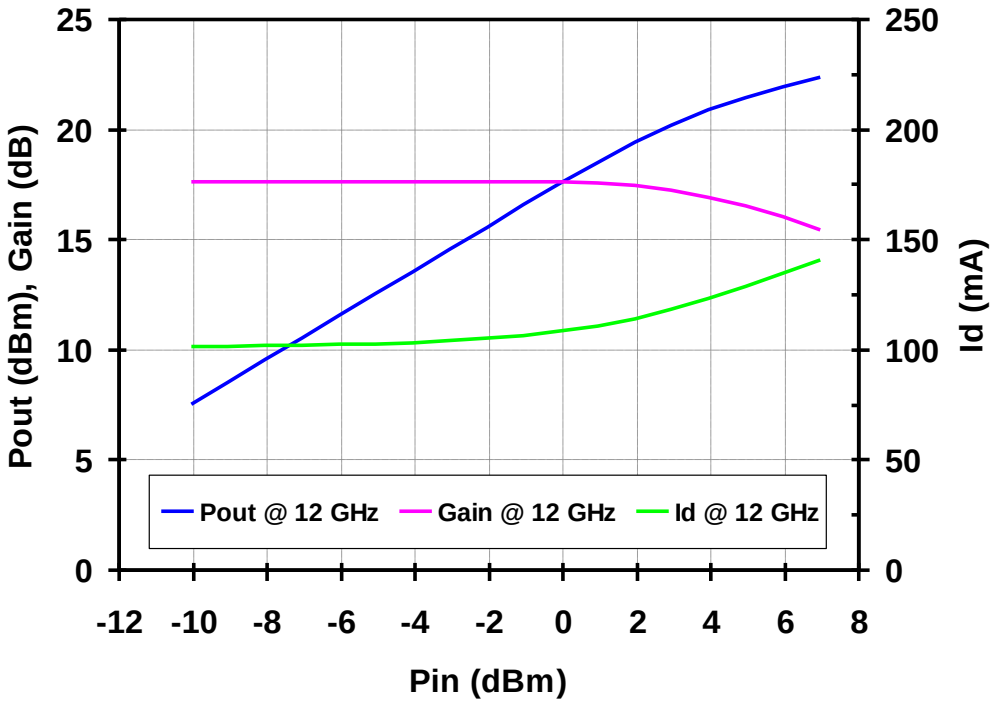

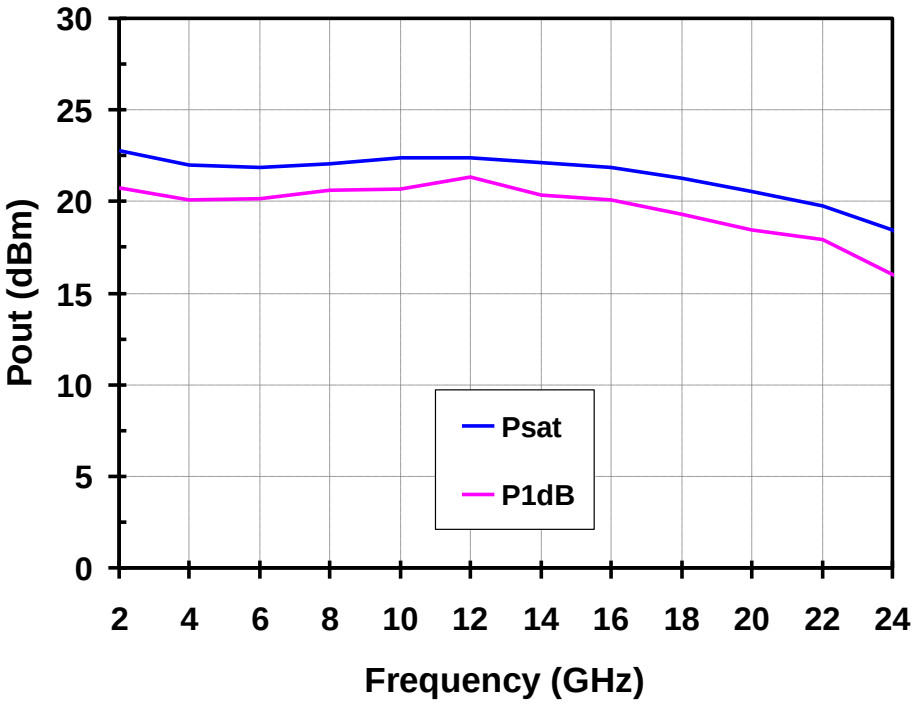

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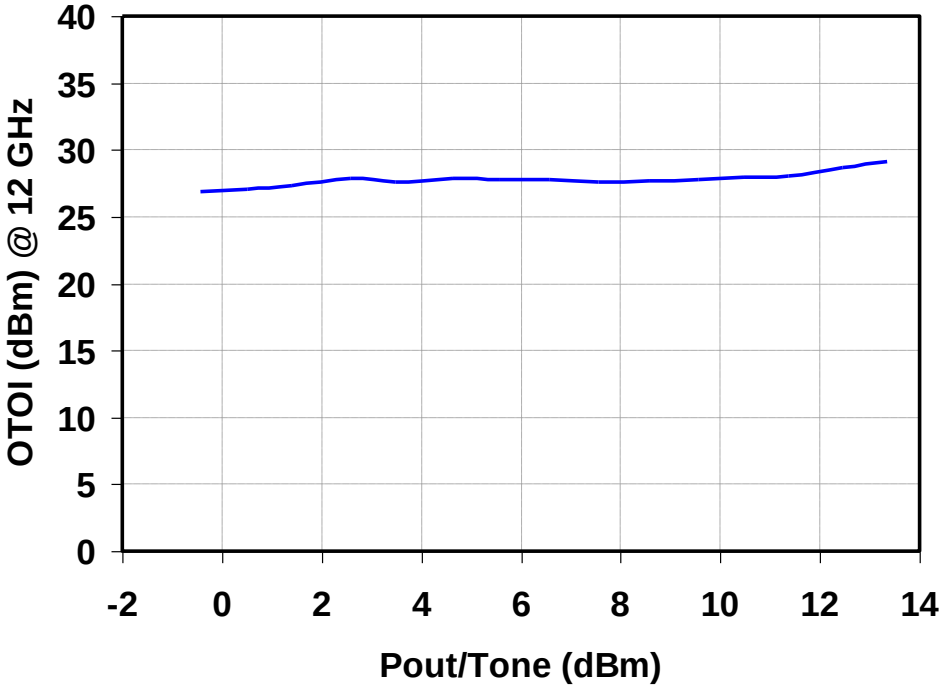
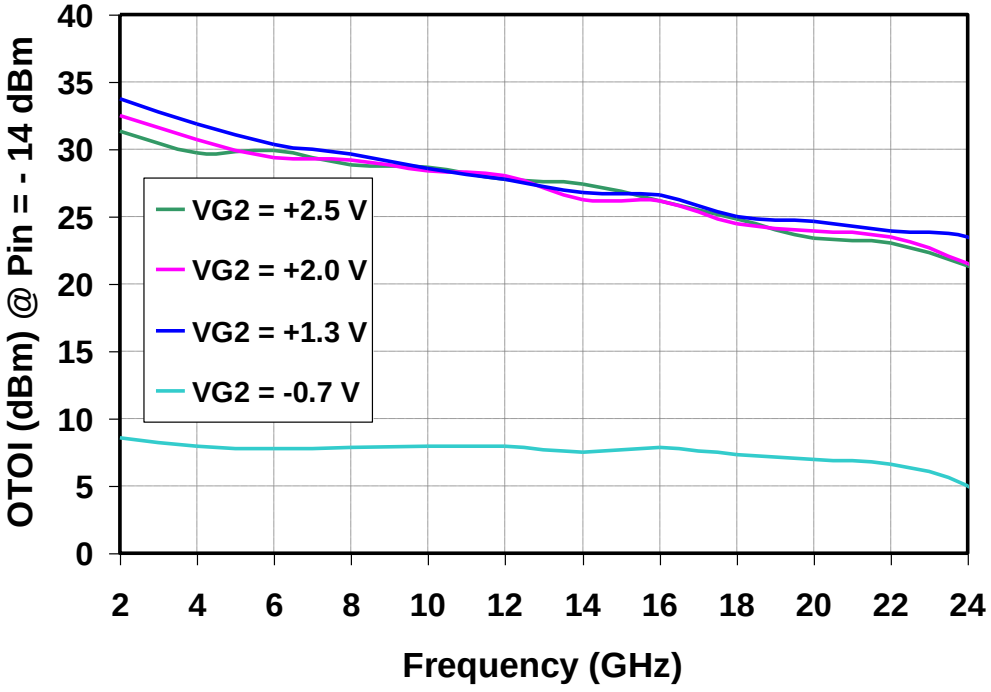
Measured Data

Bias conditions: Vd = 5 V, Id = 100 mA, Vg1 = -0.55 V, Vg2 = +1.3 V Typical





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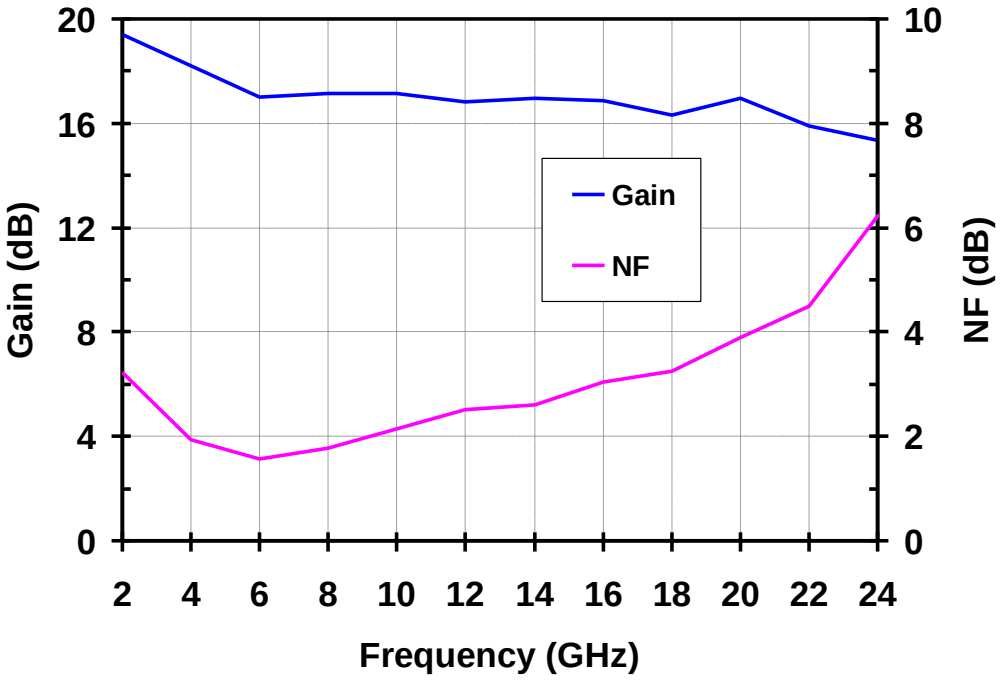

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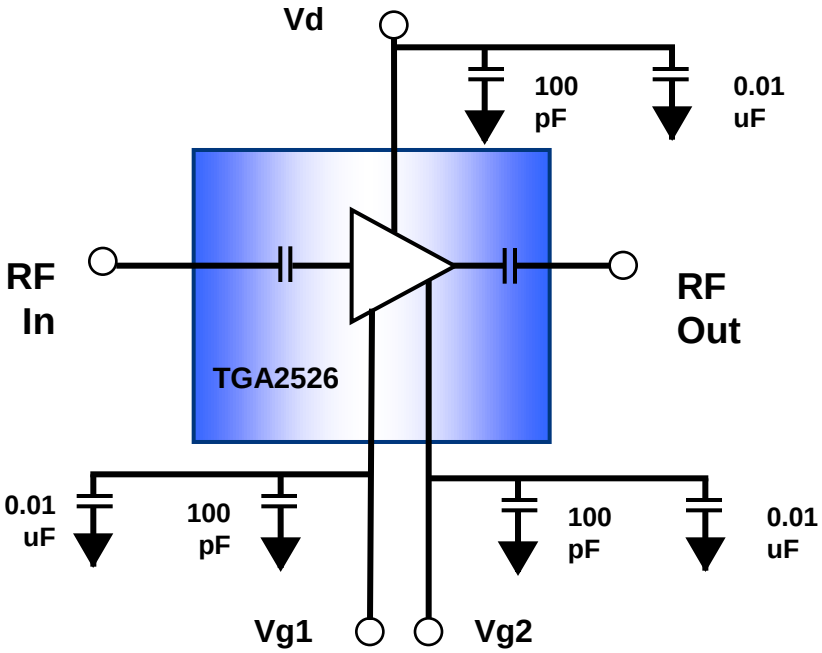
Electrical Schematic



Bias Procedures

Bias-up Procedure

Vg1 set to -1.5 V

Vd set to +5 V

Vg2 set to +1.3 V

Adjust Vg1 more positive until Id is 100 mA.
This will be ~ Vg1 = -0.55 V

Apply RF signal to input

Adjust Vg2 to obtain desired gain.

Bias-down Procedure

Set Vg2 to +1.3 V

Turn off RF supply

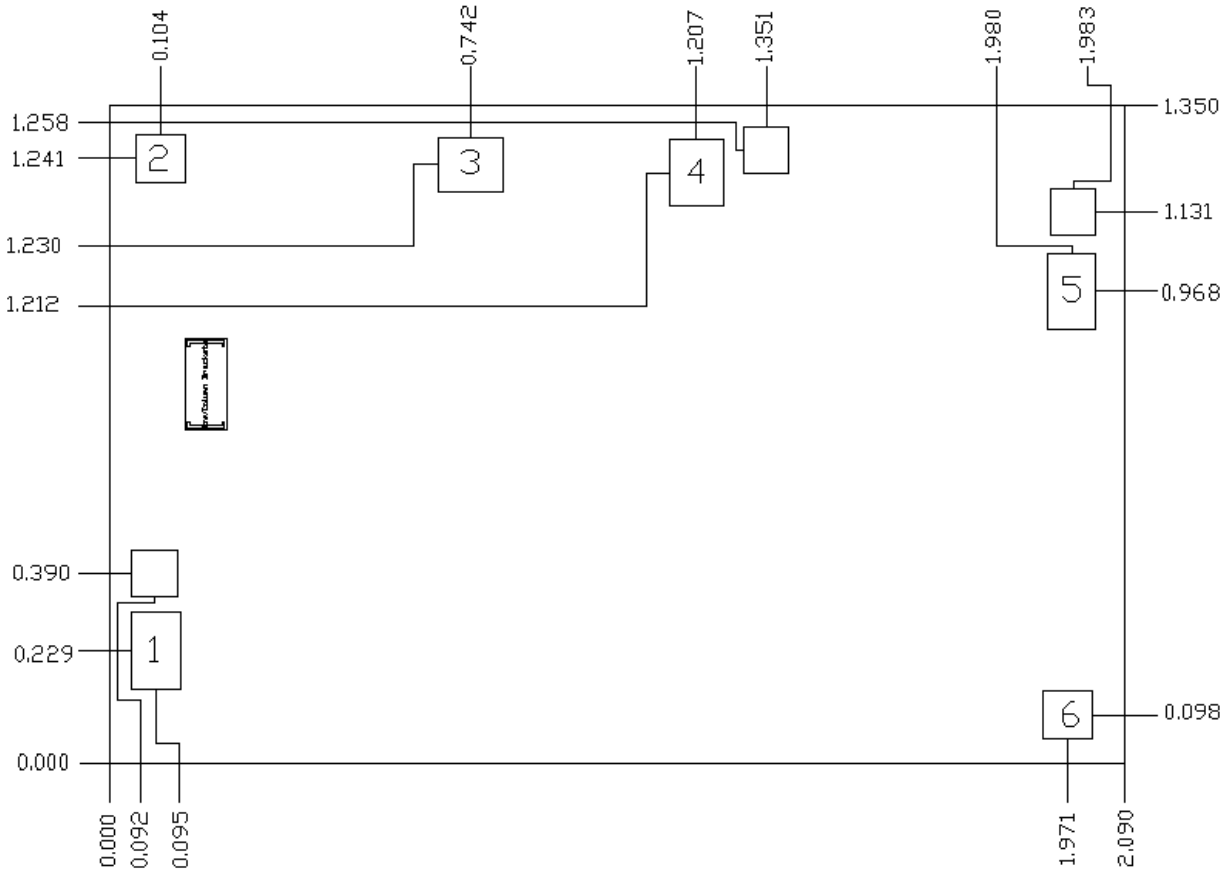
Reduce Vg1 to -1.5 V. Ensure Id ~ 0 mA

Turn Vg2 to 0 V

Turn Vd to 0 V

Turn Vg1 to 0 V

Mechanical Drawing

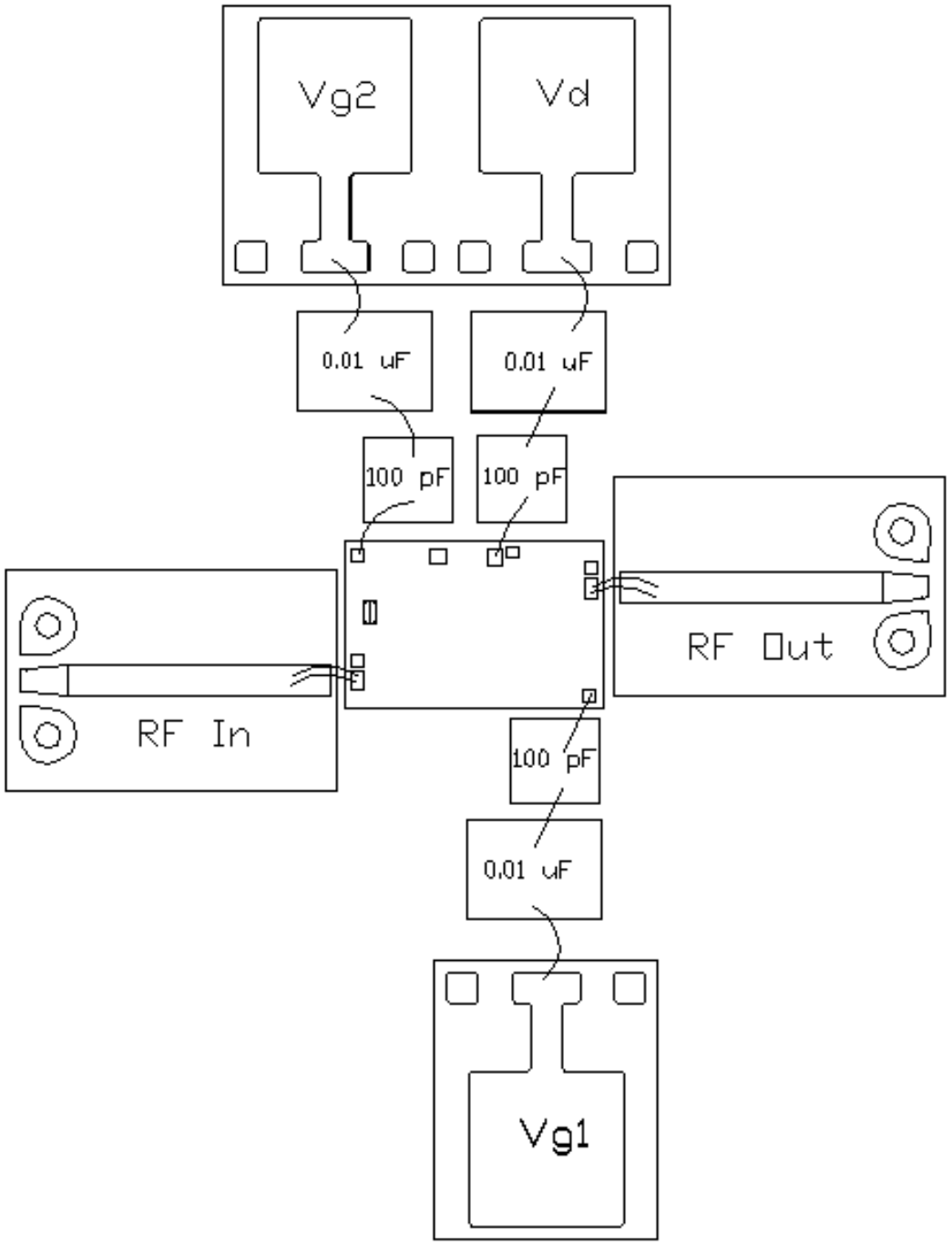


Units: millimeters
Thickness: 0.10
Die x,y size tolerance: +/ - 0.050
Chip edge to bond pad dimensions are shown to center of pad
Ground is backside of die

Bond Pad # 1	RF In	0.100 x 0.158	Bond Pad # 4	Vd1	0.110 x 0.135
Bond Pad # 2	Vg2	0.100 x 0.100	Bond Pad # 5	RF Out	0.100 x 0.158
Bond Pad # 3	Vd2 (Not used)	0.135 x 0.110	Bond Pad # 6	Vg1	0.100 x 0.100

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

Recommended Assembly Diagram



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Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e. epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

Ordering Information

Part	ECCN	Package Style
TGA2526	EAR99	GaAs MMIC Die

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